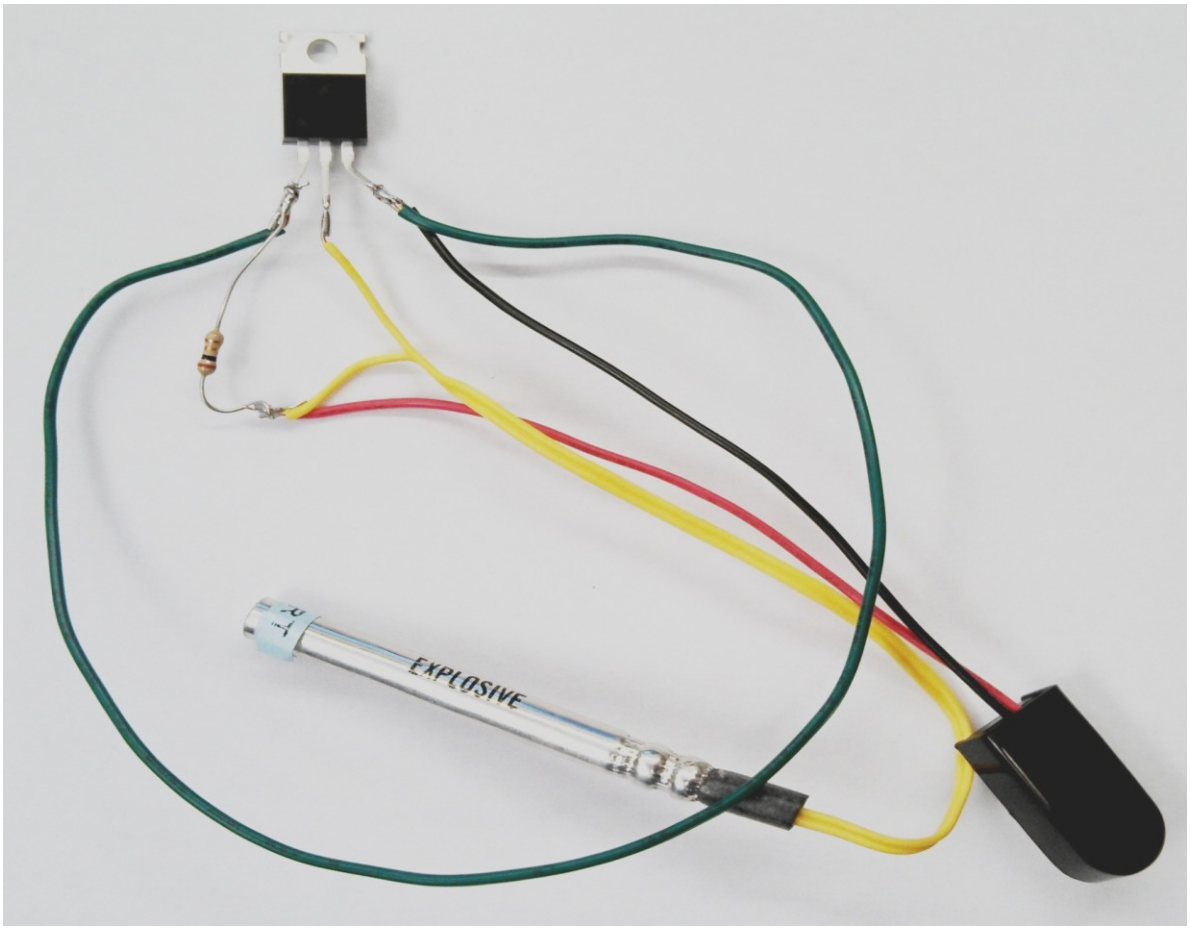
For distribution to Bomb Squad/EOD personnel only.

MOSFET Short Sheet #1

Break wire/Collapsing circuit

MOSFET circuit of use/concern to EOD.



This circuit shows an N-Channel MOSFET configured to function when the green break wire is cut. There are several "pinouts" for the type of MOSFET shown but the above picture illustrates one of the most common if not the most common. An N-channel MOSFET switches the negative side of a circuit as shown above. It will typically not work on the positive side. The pins are described left to right.

Pin 1: Is the gate pin. A small signal (typically a little less than one volt) from the positive side of a power supply will trigger the device

Pin 2: Is the drain pin. It is the switched side of the MOSFET. With no signal on the gate this pin should essentially be "off."

Pin 3: Is the source pin. This is the power that is "switched." Within this context it is connected to the negative terminal of the same power supply that is giving the positive signal to the gate.

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This MOSFET circuit is configured as a break wire or collapsing circuit. It can also be used to effectively turn the normally closed contacts of home alarm system sensors into a more functional normally open switched circuit.

The MOSFET circuit pictured above is in a "no fire" condition. The presence of the intact break wire prevents it from firing by keeping the positive signal going through the resistor from providing enough of a signal to turn the MOSFET "on." The break wire in this instance is basically a short circuit from the gate pin directly to the negative terminal. Once the break wire is "broken" it will cease to draw the positive signal from the resistor to ground and allow the gate pin to receive enough of a signal to turn the MOSFET "on" and allow current to flow to the blasting cap. Unlike an SCR, bringing the gate pin back to a negative state will turn the MOSFET "off."

Parts involved:

1. N-Channel MOSFET: IRL 640
2. ¼ watt resistor: 300 ohm to 5M ohm (just about any resistor you find will work)
3. 9 volt battery and battery snap
4. Wire

   Note: The resistor affects the battery life of the circuit. A 300 ohm resistor will drain a 9 volt battery in less than a day. A 5M ohm resistor will last years. A 300 ohm resistor will technically draw more than a ¼ watt but is close enough that it will still function properly.

Specific EOD hazards:

1. MOSFET gate pins are typically very sensitive. If the power has not been disconnected in an IED circuit, nearly any influence can turn the MOSFET "on" and function the device. Simply touching a wire connected to the gate pin will often provide enough of a signal to turn the MOSFET "on." Additionally, if a wire is attached to the gate pin it can in rare instances act as an antenna and function the IED as a result of EMR.
2. The metal tab on the back/top of the pictured MOSFET is internally connected to pin #2 (switched pin). If power has not been removed from the IED circuit and the tab is accidentally brushed against a portion of the circuit that is "negative" the MOSFET may as well be considered "on" and the IED would function.

Take away:

1. Always ensure all power sources are removed from device before considering them safe(r). Because of the properties of a MOSFET, just removing the triggers (i.e. PMRs, cell phones, photocells, etc.) will often times leave the IED in a more unpredictable and hazardous condition than before the trigger was disconnected.